

1.3 Solving Linear Systems by Elimination

Solve the following system of equations:

$$17x + 23y = 35$$

$$26x - 23y = -121$$

Solve the following system of equations:
(try adding them together)

$$\begin{array}{r} 17x + 23y = 35 \\ + 26x - 23y = -121 \\ \hline 43x = -86 \\ \hline 43 \quad \quad 43 \\ x = -2 \end{array}$$

Solving Linear Systems by Elimination

Steps:

1. Write equations in the same form: $Ax + By = C$
 $y = mx + b$
2. Look for the coefficients of one of the variables to be the same (sign does not matter).
3. If necessary, multiply one or both equations by a whole number to achieve step 2.
4. a) Same coefficient, same sign: **subtract**
b) Same coefficient, opposite sign: **add**.
5. Solve the resulting equation.
6. Substitute to find the value of the other variable.

Ex.1 Solve: ① $x + y = 60$ ② $x - y = 8$

$$\begin{array}{r}
 \textcircled{1} \ x + y = 60 \\
 + \textcircled{2} \ x - y = 8 \\
 \hline
 2x = 68 \\
 \frac{2x}{2} = \frac{68}{2} \\
 x = 34
 \end{array}$$

$$\begin{array}{l}
 \text{sub } x = 34 \text{ into } \textcircled{1} \\
 \hline
 x + y = 60 \\
 34 + y = 60 \\
 y = 60 - 34
 \end{array}$$

$$\therefore \text{The POI is } (34, 26) \quad y = 26$$

Ex.2 Solve ① $5x + 2y = 5$ ② $3x = -23 + 4y$

$$\begin{aligned} \textcircled{1} (5x + 2y = 5) \times 2 \\ \textcircled{2} 3x - 4y = -23 \end{aligned}$$

$$\begin{aligned} \textcircled{1} 10x + 4y &= 10 \\ + \textcircled{2} 3x - 4y &= -23 \\ \hline 13x &= -13 \\ \frac{13x}{13} &= \frac{-13}{13} \\ x &= -1 \end{aligned}$$

\therefore the POI is $(-1, 5)$

rearrange
 $3x - 4y = -23$

sub $x = -1$ into ②

$$\begin{aligned} 3(-1) &= -23 + 4y \\ -3 + 23 &= 4y \\ \frac{20}{4} &= \frac{4y}{4} \\ y &= 5 \end{aligned}$$

Ex.3 $\textcircled{1} \left(\frac{x}{2} + \frac{y}{8} = 4 \right) \times 8$ $\textcircled{2} \left(\frac{x}{3} - \frac{y}{2} = -2 \right) \times 6$

$$\textcircled{1} (4x + y = 32) \times 3$$

$$\textcircled{2} 2x - 3y = -12$$

$$\textcircled{1} 12x + 3y = 96$$

$$\textcircled{2} 2x - 3y = -12$$

$$\begin{aligned} 14x &= 84 \\ \frac{14x}{14} &= \frac{84}{14} \end{aligned}$$

$$x = 6$$

Assigned Work:

p.54 # 1, 4, 6odd, 11odd, 20*